SPORTS MEDICINE AUSTRALIA

Extreme Heat Policy

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Disclaimer

The information in this policy is general. Reading or using this policy is not the same as getting medical advice from your doctor or health professional. All reasonable attempts have been made to ensure the information is accurate. However, SMA is not responsible for any loss, injury, claim or damage that may resultfrom using or applying the information in this policy. The information in this policy should be considered and interpreted in the context of other risk management,insurance, governance and compliance frameworks and obligations relevant to sporting organisations. Familiarity with relevant International Sports Federation (ISF), National Sporting Organisation (NSO) and StateSporting Organisation (SSO) policies and requirements is essential to enable appropriate interpretation and application of the information in this policy.

The New Sports Medicine Australia (SMA) Extreme Heat Policy

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Introduction

Sport is a cornerstone of the Australian way of life. In 2019, 90% of adults (over the age of 15 years) participated in sport or physical activity. Another defining feature of Australia is its climate. Summers are long and very hot, with ambient temperatures in the shade regularly exceeding 35 to 40 C in most major cities and surrounding areas. Moreover, high levels of humidity that are often present impede the dissipation of heat due to a restriction of sweat evaporation. As such, the risk of heat illness, which is characterised by nausea, dizziness, vomiting and syncope, and can even result in death, is progressively greater as the environment becomes hotter and more humid. During exercise however, the combination of temperature and humidity at which heat illness develops are much cooler and drier, due to the large quantities of heat that are generated by active muscles.

While fatal heat injury during sport is relatively rare, thousands of cases of heat-related illness (e.g. heat exhaustion) during sport competition/training have been reported. However, cases captured in these data are only those resulting in direct hospitalisation, and it is widely accepted that the incidence rate of heat-related illnesses in sport is vastly underreported. Due to this concern, Sports Medicine Australia (SMA) has historically developed extreme heat policies as a protective measure.

The new SMA Extreme Heat Policy utilises the latest published research evidence to inform a) a biophysical model for predicting heat stress risk; and b) recommended cooling strategies that can be used to optimally mitigate heat stress risk. The new policy also adopts a continuous approach to defining heat stress risk thresholds in place of stepwise categories and covers gaps in the previous policy for conditions that often occur in many states and territories that are very hot (35-40 C) but dry (<10%RH), which yield relatively low dew point temperatures yet induce high levels of sweating and physiological strain, particularly during exercise. A broad differentiation between the thermal effects of activity levels and clothing/equipment worn across a range of popular sports in Australia is also provided.

The aim of this policy is to provide evidence-based guidance for protecting the health of those participating in sport and physical activity from the potentially ill effects of extreme heat in the summer, while ensuring that play is not unnecessarily interrupted. As new research findings emerge, the policy will be updated accordingly. Intended users are sporting administrators, coaches and sports medical teams responsible for the safety and wellbeing of people engaging in sport and physical activity in hot weather, as well as individuals wishing to manage heat stress risk during planned training activities.

Background

Assessment of heat stress risk is based on a fundamental heat balance model that determines the combination of temperature (measured in the shade) and humidity at which critical levels of heat stress risk to health are predicted to occur. These models are also adjusted for the effects of thermal radiation from the sun, and air flow from wind. Once a threshold is reached, a colour coding system recommends actions that can be taken to reduce heat-health risk.

This SMA policy provides recommendations for a range of sports based on participation rates from the 2019 AusPlay survey. All included sports are split into 5 "risk classification" groups according to the combined effects of exercise intensity and clothing/equipment worn. These classifications are summarised in the Table below.

Sport Risk Classification				
1	**2**	**3**	**4**	**5**
Walking (leisurely)	Archery	Abseiling	Baseball	Field Hockey
	Bowls	Australian Football	Bushwalking	Mountain Biking
	Field Athletics	Basketball	Cricket	
	Fishing	Cycling	Equestrian	
	Golf	Canoeing	Horseback riding	
	Lifesaving Surf	Caving	Motor Cycling	
	Sailing	Kayaking	Rugby Union	
	Shooting (Pistol/Trap)	Netball	Rugby League	
	Walking (brisk)	Oztag	Softball	
		Rock Climbing		
		Rowing		
		Soccer		
		Tennis		
		Touch Football		
		Long Distance Running		
		Triathlon		
		Volleyball		

Each group has its own temperature/humidity graph that should be used to assess heat stress risk. See Figures 1 to 5.

Using the new SMA Extreme Heat Policy

To predict the heat risk associated with participation in a relevant sporting classification, the temperature and humidity for the location where competition or practice will be taking place needs to be acquired. It is essential that the peak temperature during the time of play is used ***with the accompanying relative humidity at that specific time***. If the peak relative humidity is used for a particular day, which usually occurs when temperature is lowest, heat stress risk will be over-estimated and competition unnecessarily disrupted or cancelled.

To obtain a forecast of temperature and humidity for the upcoming 72 hours:

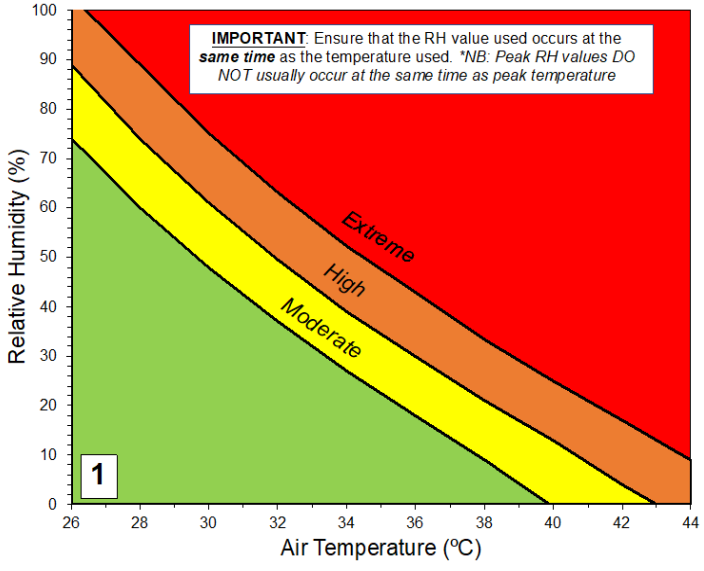
1. Visit: http://www.bom.gov.au/places/ and enter your location/post code.
2. Click on: "DETAILED 3-HOURLY FORECAST"
3. Select the specific day/date of enquiry
4. Identify the column with the nearest time to the planned competition/practice
5. Note the "Air Temperature (˚C)" value
6. AND IN THE SAME COLUMN, note the concurrent "Relative Humidity (%)" value found towards the bottom of the entry for that date

NOTE: Reported temperatures and humidity values will only be estimates. The most accurate conditions can be measured locally with devices such as the Environmental Measurement Unit (EMU) from The University of Sydney.

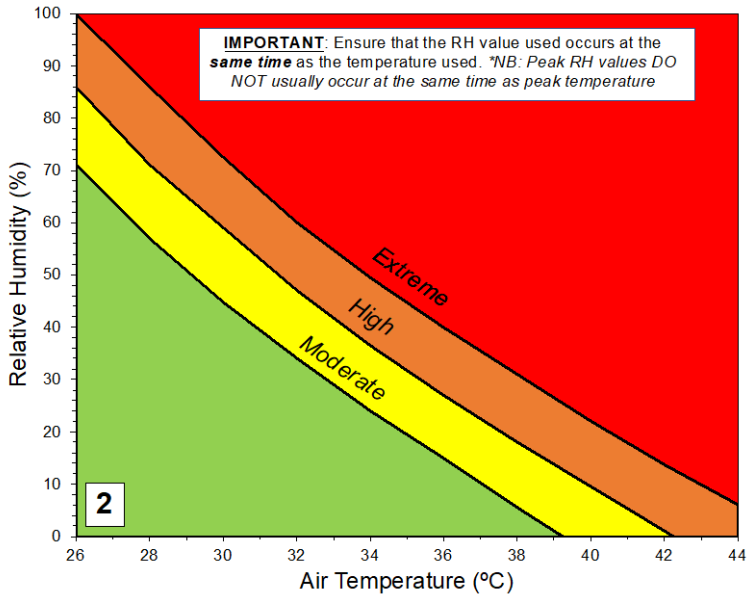
The combined Air Temperature (x-axis) and Relative Humidity (y-axis) should then be plotted on the appropriate Figure for your specific sport. The point of intersection of these two values will subsequently fall in one of 4 coloured zones indicating a given level of heat stress risk:

GREEN: Low Risk
YELLOW: Moderate Risk
ORANGE: High Risk
RED: Extreme Risk

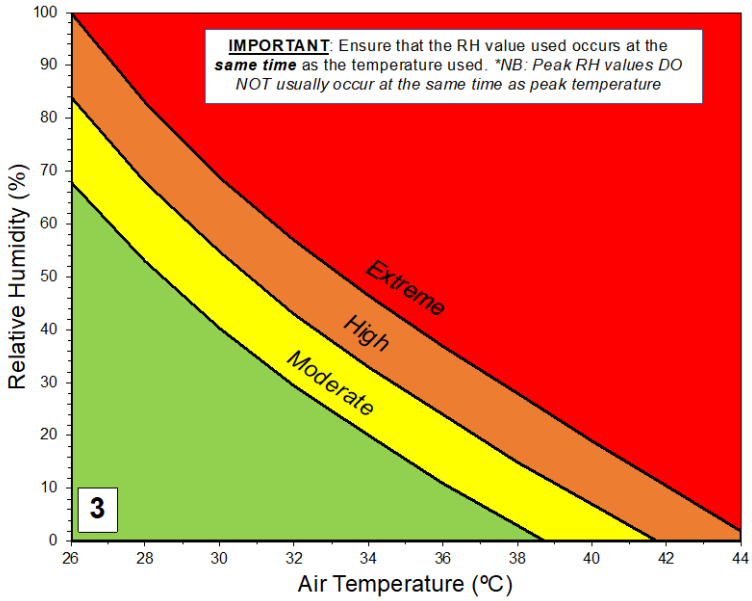
Sport Risk Classification 1



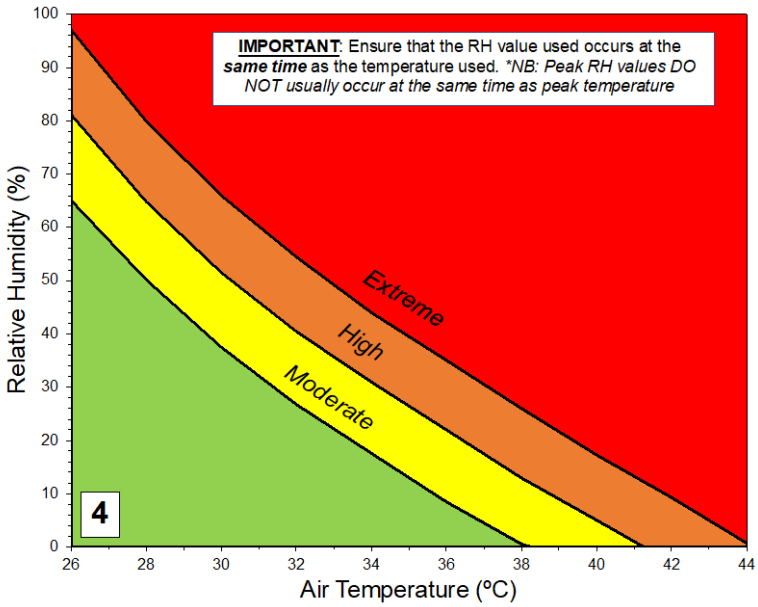
Sport Risk Classification 2



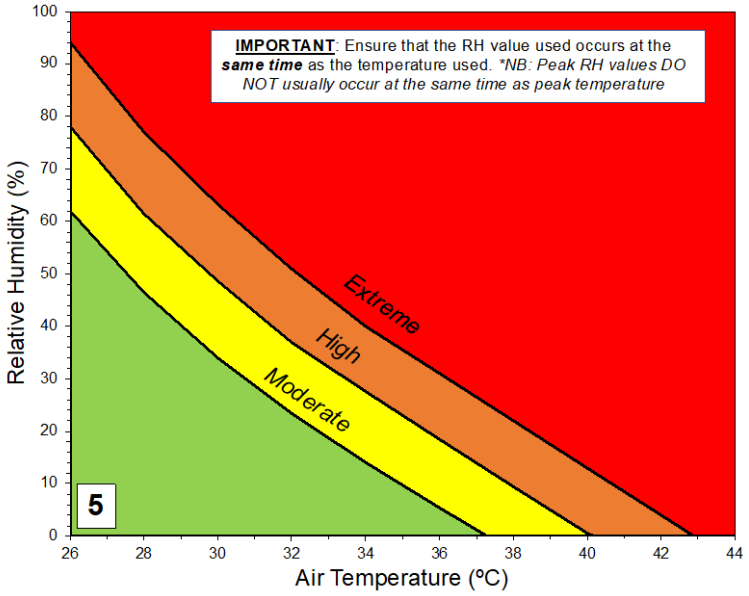
Sport Risk Classification 3



Sport Risk Classification 4

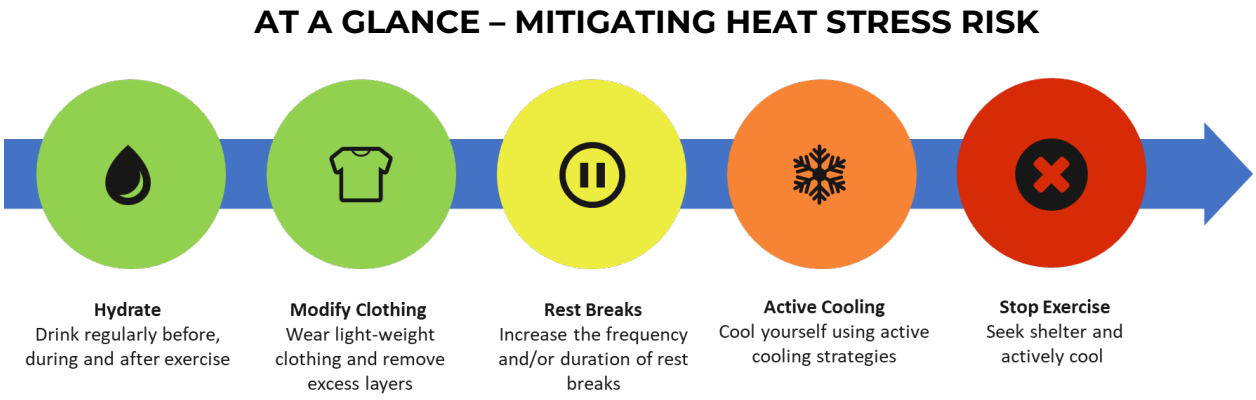


Sport Risk Classification 5



Mitigating Heat Stress Risk

Accompanying each rating are recommended actions that can be taken to mitigate the prevailing heat stress risk:



The specific heat stress mitigation strategy used depends on the type of sporting activity, however general recommendations that can be implemented across most sports are detailed below.

Plan ahead to ensure you are able take the most appropriate precaution to stay safe when exercising in the heat.

GREEN: *Hydrate and Modify Clothing*

When heat stress risk is low, maintaining hydration through regular fluid consumption and modifying clothing is still a simple, yet effective, way of keeping cool and preserving health and performance during the summer months.

You should:

- Ensure pre-exercise hydration by consuming 6 ml of water per kilogram of body weight every 2-3 hours before exercise. For a 70 kg individual, this equates to 420 ml of fluid every 2-3 hours (a standard sports drink bottle contains 500 ml).
- Drink regularly throughout exercise. You should aim to drink enough to offset sweat losses, but it is important to avoid over-drinking because this can also have negative health effects. To familiarise yourself with how much you typically sweat, become accustomed to weighing yourself before and after practice or competition.

The clothing/equipment you wear can influence how quickly you heat-up during exercise. Simple clothing modifications can help to keep you cool.
You should:

- Where possible, select light-weight and breathable clothing with extra ventilation
- Remove unnecessary clothing/equipment and/or excess clothing layers
- Reduce the amount of skin that is covered by clothing – this will help increase your sweat evaporation, which will help you dissipate heat.

NOTE: Sunscreen does NOT impede sweating or affect heat loss from the skin. Sunscreen should be applied regularly, as per instructions, to avoid sunburn.

YELLOW: *Rest Breaks*

When the heat stress risk is moderate, increasing the frequency and/or duration of your rest breaks during exercise or sporting activities is an effective way of reducing your risk for heat illness even if minimal resources are available.

- During training sessions, provide a minimum of 15 minutes of rest for every 45 minutes of practice.
- Extend scheduled rest breaks that naturally occur during match-play of a particular sport (e.g. half-time) by ~10 mins. This is effective for sports such as soccer/football and rugby and can be implemented across other sports such as field hockey.
- Implement additional rest breaks that are not normally scheduled to occur. For example, 3 to 5-min “quarter-time” breaks can be introduced mid-way through each half of a football or rugby match, or an extended 10-min drinks break can be introduced every hour of a cricket match or after the second set of a tennis match.
- For sports with continuous play without any scheduled breaks, courses or play duration can be shortened
- During all breaks in play or practice, everyone should seek shade – if natural shade is not available, portable sun shelters should be provided, and water freely available.

NOTE: While hats provide UV protection, they provide minimal protection against the heat.

ORANGE: *Active Cooling*

When the heat stress risk is high, active cooling strategies should be applied during scheduled and additional rest breaks, or before and during activity if play is continuous. Below are strategies that have been shown to effectively reduce body temperature. The suitability and feasibility of each strategy will depend on the type of sport or exercise you are performing.

- Drinking cold fluids and/or ice slushies before exercise commences. Note that cold water and ice slushy ingestion during exercise is less effective for cooling
- Submerging your arms/feet in cold water
- Water dousing – wetting your skin with cool water using a sponge or a spray bottle helps increase evaporation, which is the most effective cooling mechanism in the heat
- Ice packs/towels – placing an ice pack or damp towel filled with crushed ice around your neck
- Electric (misting) fans – outdoor fans can help keep your body cool, especially when combined with a water misting system

NOTE: The application of substances such as menthol to the skin can induce a cool sensation, but they do not physically cool the body and therefore do not lower the risk of heat related illness.

RED: *Stop Exercising*

When the heat stress risk is extreme, exercise/play should be suspended. If play has commenced, then all activities should be stopped as soon as possible.

- All players should seek shade or cool refuge in an air-conditioned space if available
- Active cooling strategies should be applied

Preparing for exercise in the heat

On the day

Optimally preparing for exercise in the heat will reduce the subsequent risk of heat related illness. If hot weather is forecasted, during the preceding 24 hours you should:

- Avoid extended strenuous exercise that will substantially pre-elevate core temperature
- Ensure you are well hydrated – drink water regularly the day before and drink 500 ml of water 1-2 hours before play begins
- If caffeine-habituated (e.g. you typically drink multiple cups of coffee a day), you should avoid high caffeine doses in the hours leading up to play as lower levels of skin blood flow result in higher core temperatures
- Immediately before exercise, you can pre-cool the body by drinking cold water or an ice slushy, immersing the lower half of your body in cold water, or wearing an ice vest

NOTE: Taking anti-pyretic medication such as acetaminophen (i.e. paracetamol) does NOT lower the body temperature response to exercise, and is therefore NOT recommended as a way to reduce heat stress risk.

In the days/weeks before

Acclimatising to hot weather is a well-established longer-term method for reducing the risk of heat-related illness during exercise. Physiological adaptations include a reduction in core temperature, an expanded blood plasma volume that lowers heart rate, an increase in maximum sweat rate, a cooler thermal sensation, and a reduction level of perceived exertion.

To optimally acclimatise to the heat, you should:

- Frequently (i.e. daily) expose yourself to the type of conditions that you will be playing in (e.g. hot/humid, very hot/dry) for 45-90 minutes per day for a minimum of 5, and preferably up to 14, consecutive days.
- Exercise in these conditions at the same perceived effort – as you begin to adapt the absolute level that you are working at will increase.
- If protective equipment is usually worn, none should be worn for the first 3-4 days, and then the equipment levels should be gradually increased each subsequent day.

NOTE: Because extended and frequent exposure to exercise-heat stress is required to attain complete adaptation, additional thermal protection from heat acclimatisation should not be assumed if exercise intensities and exposure frequency is low.

Recognising signs and symptoms of heat-related illness

Whenever exercise or sport is being carried out in the heat, irrespective of the heat stress risk level, recognising the signs and symptoms of heat-related illness is essential for ensuring the safety and wellbeing of all participants.

Heat-related illnesses represents a spectrum of disorders, ranging from mild symptoms to a life-threatening illness. The health impacts of heat-related illness can be a direct result of an increase in core temperature or the result of the strain on the heart associated with defending the rise in body temperature.

The symptoms and signs of heat related illness and the immediate management procedures are summarised in the Table overpage.

Who is especially at risk of heat-related illness?

While even the fittest athlete can fall victim to heat-related illness, certain people are especially vulnerable:

- Aged over 65 years, especially if unfit. Note that age effects on thermoregulation may become progressively worse with age, so risk is generally greater with more advanced age
- Heart or kidney disorders / disease presents a greater risk of cardiovascular or renal failure during or following exercise in the heat
- Recently sick with a fever
- Taking prescription medications that impair sweating
- A reduced ability to behaviourally respond to heat, e.g. due to mental health challenges or substance abuse
- Very high body fat
- Recently (in the past week) arrived from a cold climate

	Heat Exhaustion / Syncope	Exertional Heat Stroke (EHS)
Symptoms (what the person might feel)	– Headache – Dizziness – Weakness – Nausea – Vomiting	– Brain symptoms including: o Confusion o Agitation – Symptoms can develop rapidly – EHS is a medical emergency
Signs (what you might see)	– Fainting – ↑Heart rate – ↓Blood pressure – Core temperature usually < 40°C – Absence of brain symptoms	– Brain symptoms including: o Confusion o Unsteadiness o Aggressive or irrational behaviour o Altered level of consciousness, seizures, coma – ↑Heart rate, ↑breathing rate, ↓blood pressure – Core temperature usually > 40° C
Immediate management	– Move to shade and cool – Remove as much clothing as possible – Remove protective equipment (e.g. helmet, pads) – Apply lots of water to skin – Oral Fluids – Lie on back with legs elevated – Watch for worsening	– ABC (airways, breathing, circulation) – Aggressively col the body with ice and water – Call ambulance – Continue cooling while transfer to hospital * Cool first, transport second *

NOTE: It is currently unclear if heat stress risk is truly elevated in children. Similarly, some reports indicate that pregnant women exposed to extreme heat may be at elevated risk negative birth outcomes, but no evidence links this with exercise, which is known to provide extensive benefits to mother and baby. Thermoregulatory capacity during pregnancy is also not compromised.